REMARKS

This application has been reviewed in light of the Office Action dated June 22, 2009. Claims 1-7 are presented for examination, of which Claims 1 and 7 are in independent form. Claims 1 and 7 have been amended to define more clearly what Applicant regards as his invention. Favorable reconsideration is requested.

Claims 1 and 4 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,417,019 (*Mueller et al*; hereinafter "*Mueller*"). Claims 1 and 4 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mueller*. Claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mueller* in view of International Pat. Appln. Pub. No. 00/12226 (*Jones et al.)*; Claim 5 was rejected over *Mueller* in view of U.S. Patent Application Publication No. 2003/0181122 (*Collins, III*); and Claim 6 was rejected over *Mueller* in view of U.S. Patent No. 6,483,196 (*Wojnarowski*). Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,886,401(*Liu*) in view of *Mueller*. Applicant submits that independent Claims 1 and 7, together with the claims dependent therefrom, are patentably distinct from the cited prior art for at least the following reasons.

Claim 1 is directed to a method for producing a white LED of predetermined color temperature. The method includes determining a wavelength of at least one of an uncoated blue LED or an uncoated UV LED of a plurality of LEDs. The method also includes determining once a quantity and a concentration of a conversion layer to be applied over the at least one uncoated blue LED or uncoated UV LED based on at least the wavelength determined, wherein the conversion layer includes a color conversion agent, the conversion layer configured to absorb at least one of blue light and UV light, and emit light of longer wavelength. The method further includes coating the at least one uncoated LED or the UV LED of a plurality of LEDs, with the conversion layer having the

quantity and the concentration determined, wherein the coated LED has the predetermined color temperature.

Among other notable features of Claim 1 is determining once a quantity and a concentration of a conversion layer to be applied over the at least one uncoated blue LED or uncoated UV LED based on at least the wavelength determined. By virtue of this feature, the precise quantity and concentration of the conversion layer is determined one time and applied to the uncoated LED to achieve the desired predetermined color temperature, so that, for example, subsequent processing steps are not required.

Mueller is directed to the production of purportedly efficient light sources within the spectral range of 515 – 590 nm, in which the conventional $Al_xIn_yGa_zN$ and $Al_xIn_yGa_zP$ based LEDs show a broad minimum in efficiency, with little or no blue shift appearing with increasing the drive current. The light sources may be manufactured with high production yields in narrow peak wavelength ranges. The reference discusses phosphor materials using Eu^{2+} doped IIA-$IIIA_2$-S_4 (thiogallates,), which have a main peak at 480 nm of primary radiation emitted by the readily excited LED 8.

At column 2, lines 22 to 26 and 32 to 36, *Mueller* describes that the phosphor film thickness or concentration of phosphor particles in a color conversion layer of LED 8 can be selected to absorb a predetermined fraction of the primary light to thereby adjust the chromaticity of the mixture of the primary and secondary light. As discussed at col. 6, lines 19 to 26 of *Mueller,* the concentration of phosphor particles (to convert a desired fraction of primary light corresponding to a desired light output chromaticity of the phosphor converted LED 29) is experimentally determined by measuring the spectrum of the emitted light of the phosphor converted LED 29, where a trial phosphor concentration is used, and then further adjusting the concentration of the particles, as necessary.

In addition to varying the concentration of the phosphor material for predetermined primary/secondary light ratios, *Mueller* also discusses tuning the secondary light component (converted light) of the output spectrum of the phosphor converted LED 29 by changing the composition of the mentioned thiogallate materials. Col. 6, line 64 to col. 7, line 5 of *Mueller* states:

> In one embodiment, the composition of phosphor particles 34 is chosen to provide a phosphor converted LED 29 having an optical output with approximately a desired chromaticity. Then, after the composition is chosen, the concentration of phosphor particles 34 is adjusted to vary the fraction of nonabsorbed primary emission and thus fine-tune the chromaticity. The composition and concentration of phosphor particles 34 may be varied iteratively, for example, until the desired chromaticity is achieved.

Apparently, a first phosphor particle composition is selected to achieve an approximate chromaticity that is presumably close to a desired chromaticity and then tuning the secondary light component (converted light) by iteratively adjusting the phosphor particle composition until the desired chromaticity is achieved. By repeatedly monitoring the emission spectrum of <u>coated</u> LEDs 29 for various phosphor particle compositions applied during experimental trials, the targeted chromaticity value can eventually be reached. Apparently, the composition of the phosphor particles 34 and concentration of the phosphor grains in the phosphor layers (films) 37, 42, 46, 50 are varied <u>iteratively</u> until the desired chromaticity is achieved. Such methods are shown also in Figs. 3 to 8 in *Mueller*. The methods to deposit such phosphor coatings depend on the scattering characteristic of the applied layers (such as scattering, or non scattering ones) and the structure of the LED assemblies, for example the LED is mounted into a cup-shaped recession.

Therefore, in *Mueller*, multiple determinations of the quantity and concentration of the conversion layer to be applied over the uncoated LED are made based on <u>repeated</u> experimental measurements of the emission spectrum of <u>coated</u> LEDs 29, and

are required to determine a phosphor particle composition to achieve a desired chromaticity. In contrast to *Mueller*, by virtue of the method of Claim 1 the quantity and concentration of the conversion layer is determined once based on a determination of the wavelength of at least one of an uncoated blue LED or an uncoated UV LED of a plurality of LEDs. Nothing has been found, or pointed out, in *Mueller*, that would teach or suggest these features.

For at least these reasons, Claim 1 is believed to be allowable over *Mueller*.

Claim 7 is directed to a white LED light source, comprising a plurality of blue LEDs or UV LEDs. Above each of the LEDs a conversion layer having a thickness is disposed. The thickness of the conversion layer is proportional with a determined wavelength of the blue or UV LED concerned.

By virtue of the features of Claim 7 each LED of the plurality of LEDs in the white light source is covered by a conversion layer and the thickness of that layer is proportional to a determined wavelength of the respective LED. Such a determination of the wavelength can be made, for example, by measuring the emission spectrum of each LED.

Liu is related to a packaging structure for LEDs with enhanced optical output coupling efficiency, improved thermal management, and two dimensional LED arrangements with improved packaging density via direct interconnections of the LEDs. A phosphor layer 125 covers the bottom side (outer surface) of a substantially transparent epoxy substrate piece 124, in which the plurality of LEDs 114 are incorporated. On the top of the substrate 124 a polymer layer 118 is applied, where the back side contacts are deposited as metallization 122, and electrically bonded through vias 120 to the LEDs' interconnect contact pads 116, 117, as shown for example in array 2, illustrated in Fig. 2, and described in col. 3, lines 33 to 47. Apparently, the applied phosphor layer 125 has a

<u>uniform</u> thickness with a <u>constant</u> composition over the plurality of LEDs 114 of the array 2. The Office Action cites col. 3, lines 39-44 as allegedly teaching or suggesting that the thickness of the layer 125 is proportional with a determined wavelength of the blue or UV LED concerned.

The Office Action suggests that coated blue or UV LEDs discussed in *Mueller* could be used in the array of LEDs in *Liu* and would have been successful in arriving at the claimed invention "since white light is comprised of at least the three primary colors (e.g., red, green, and blue).". (Office Action, at bottom of page 9).

However, such a proposed modification would have little (if any) likelihood of success, and would render the array of *Liu* unsatisfactory for its intended use. Indeed, even if (assuming arguendo) *Mueller's* coated LEDs were attempted to be incorporated in *Liu's* LED array 2 as suggested in the Office Action, and those *Mueller* LEDs were to be further covered with the applied *Liu* phosphor layer 125, the resulting combined thicknesses of the conversion layers disposed above each LED would not be proportional to the determined wavelength of the blue or UV LED concerned. Therefore, the proposed array would fail to produce homogeneous white light color emission.

Moreover, the Office Action concedes that *Liu* does not disclose LEDs 114 comprised of blue or UV LEDs. To remedy this deficiency the Office Action cites *Mueller* as allegedly disclosing that blue or UV LEDs can be coated with a conversion layer to produce various light colors. However, even if *Liu* and *Mueller* were attempted to be combined as suggested in the Office Action (assuming such a combination would even be permissible), because neither *Liu* nor *Mueller* teaches or suggests a determination of the wavelength (i.e., spectrum) of each individual LEDs used in the light source, the resulting combination also would fail to teach or suggest those features.

Indeed, Applicant submits that a combination of *Liu* and *Mueller*, assuming such combination would even be permissible, would fail to teach or suggest a determination of the wavelength of each LED of a plurality of LEDs used in the light source, much less, a conversion layer having a thickness that is proportional with a determined wavelength of the blue or UV LED concerned, as in Claim 7.

Accordingly, Applicant submits that Claim 7 is patentable over those references, whether considered separately or in combination, and respectfully requests withdrawal of the rejection under 35 U.S.C. § 103(a).

A review of the other art of record has failed to reveal anything that, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as applied against the independent claims herein. Therefore, those claims are respectfully submitted to be patentable over the art of record.

The other rejected claims in this application depend from Claim 1 discussed above and, therefore, are submitted to be patentable for at least the same reasons as is that respective claim. Because each dependent claim also is deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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